

out with tweezers. The lower part of the tube is drawn out for connection with the mercury pump. The powders used for experiment were carefully painted on the opposite sides of pith or mica disks, only water or alcohol being used.

Disks coated on alternate sides with chromic oxide and precipitated selenium move in one direction to the naked flame of a candle, and in the other direction when a water screen is interposed. With safranin and hydrated zinc oxide the instrument does not move at all when exposed to the naked flame, but revolves when a water screen is interposed. With thallic oxide and Magnus's green platinum salt, the instrument moves strongly when no screen is interposed, but is stopped with a water screen. These results are all in conformity with the figures.

A pith radiometer coated with precipitated selenium and chromic oxide was exposed to the radiation from a colourless gas flame from a Bunsen burner, coloured intensely green by thallium. To the eye, by this light, the chromic oxide looked nearly white, and the selenium black. The rotation due to the repulsion of the chromic oxide was, however, apparently as strong as when the non-luminous flame was used. This experiment proves that certain substances have an opposite absorptive action on rays of dark heat to what they have on light, and that an optically white body may be thermically black, and *vice versa*. In this case, for instance, chromic oxide was optically green, and thermically black, while scarlet selenium was thermically white and optically black. W. CROOKES

(To be continued)

METEOROLOGICAL ORGANISATIONS

IN the *Journal* of the Royal Statistical Bureau of Prussia for 1878, there is published a report on the meteorological organisations of the chief countries of Europe, Part I., by Dr. Gustav Hellmann, who is rapidly coming to the front as a first-class meteorologist. In addition to considerable mental capacity and much enthusiasm for the science, Dr. Hellmann has, at the instance, and with the assistance of the Prussian Minister of Public Instruction, especially qualified himself for the work by undertaking tours more or less prolonged, in the countries the meteorological systems of which he reports on. These in the Part before us are the various systems in France, Great Britain, Belgium, and Holland. With the aid of a renewed grant he sets out on a second tour, this time through northern Europe, especially Russia, for the purpose of presenting similar reports on the meteorology of these countries. This action on the part of the Prussian Government has been taken, in view of a contemplated reorganisation of its meteorological system, so that when the time comes, the system may be established, not at haphazard, but on a sure basis, founded on the fullest knowledge of the requirements of the science, and on the best means to be adopted for its healthy development.

The Weather Telegraph systems of France, Great Britain, Belgium, and Holland, are fully detailed, very special attention being given to the weather warnings of France, carried out for the benefit of agriculture and horticulture. This system of weather warnings, which is so peculiarly adapted to the wants of Germany, was, as our readers are aware, the last gift to meteorology of the great Leverrier, to whom, in its practical bearings, meteorology stands so deeply indebted.

As regards France, meteorology would appear to have a most hopeful future before it, as evidenced by the mental activity brought to bear on the science, the fertility of resource in devising new methods and subjects of observation, the breadth of view shown in making the study of weather and climate subserve great public interests, and withal by the pecuniary assistance liberally and heartily

given by Government and other bodies intrusted with the public funds, to the observatories, societies, and associations in various parts of France that are doing its meteorological work. Among the more special work France is doing may be noticed the application of the electric thermometer to the observation of the temperature of the air at great heights and of the soil at great depths; the establishment of several stations in Paris for the investigation of the chemistry and micrography of the atmosphere in their relations to the health of the city; and the establishment of high-level stations, which has been done largely through assistance given from the public purse.

We note with the liveliest satisfaction the great increase of meteorological stations over these four countries, the introduction of instruments for continuous observations in regions where they were much required, and a more adequate observation of the rainfall, particularly in the British Isles, where about 2,100 rain-gauges are at work, and in the river-basins of France, where the rainfall is noted at 1,111 stations.

Forcible attention is directed to the fact that in some cases the reduction of the observations and publication of the results are not carried out, or carried out very imperfectly, so that no little difficulty is experienced when conducting climatological inquiries, in obtaining the data from considerable portions of Western Europe. This defect ought to be rectified without delay.

Reference is made to international stations, or stations at which observations are made for purposes of international meteorology. But on looking at the diverse hours of observation adopted by the different European systems, it is evident that the attempt recently made to found an international meteorology must be regarded as a failure, since the prime and most elementary condition of uniformity as regards hours of observation has been neglected, the just views on this vital point propounded by Humboldt and the meteorologists of his time being at present, if appreciated, entirely set aside.

MYCOLOGY¹

IT is perhaps not generally known how very numerous are the specimens comprised under the branch Mycology. The mycological herbarium which is in the course of transmission to Kew consists of at least 10,000 species, of which 7,500, comprising the Hymenomycetes and Ascomycetes, have already been forwarded. But not only are many species very beautiful in form and colour, but the subject is one of great interest both in a physiological and economical point of view, apart from mere distinction of species and nomenclature, and, therefore, while especial journals are devoted to entomology, malacology, algology, and other branches of natural history, it is quite right that we should have one devoted to fungi. M. Roumeguère ought, however, to have mentioned that England already possesses one in *Grevillea* quite equal to the French journal, which has appeared with great regularity ever since 1872, and is monthly instead of trimestrial, of the existence of which he could scarcely be ignorant, as it is referred to more than once in the number before us.

The Journal before us commences with a paper on the much-vexed question of the real nature of lichens, in which the author is altogether opposed to Schwendener's theory of their parasitic growth on Algæ. There are two points which ought to be noticed: that the growth of *Gonidia* from *Hyphæ* was observed by Mr. Berkeley, as recorded in the "Introduction to Cryptogamic Botany,"² while the stem of the curious

¹ "Revue Mycologique: Recueil trimestriel consacré à l'étude des Champignons." Par M. C. Roumeguère. (Paris: J. B. Baillière et Fils.)

² "Int. Crypt. Bot.," p. 373, Fig. 78a.

³ "Int. Crypt. Bot.," p. 341, Fig. 76.

genus, *Emericella*,³ a Lycoperdoid, is composed of bodies which closely resemble *Palmella botryoides*, Grev. The fungus was found on the leaves of *Euphorbia nerifolia*, in the hot country of Secunderabad, a very unlikely locality for a *Palmella*. Though the observations in the paper are not absolutely convincing, they are highly worthy of consideration, and may induce the advocates of the theory of Schwendener to reconsider the matter and make fresh experiments.

The other papers in the number do not require any especial consideration, though it may at once be allowed that they contain much matter of interest, scarcely, however, so much as regards physiology as might have been wished, for that, after all, is the point which is most likely to engage general interest. It is very unfortunate that the Tulasnes, after doing so much for mycology, have of late retired almost entirely from their former line of study. It is impossible to give too much credit to the result of their researches, or the admirable drawings with which they are abundantly illustrated. There are, however, other labourers in the field who are carrying on their work, amongst whom it is impossible to neglect De Bary, even when such observations as those on the development of *Ascobotus* may require confirmation. They are too curious and important to be set aside without fresh examination, and whatever views may prevail as to the nature of lichens, it is so certain that they are essentially fungals, that the origin of the fructification must be the same, or at least analogous. Much remains to be done as to the impregnation of the English fungi, for Mr. W. Smith's ingenious paper on the fructification of *Agaricus lacrymabundus* cannot at present be received as more than a mere speculation. De Bary's observations on the supposed occurrence of asci in *Agaricus melleus* are confessedly due to the presence of a parasitic Hypomyces. M. Cornu, however, is attending to this as to many other objects of interest; while van Tieghem is adding daily to our knowledge of the different kinds of *Mucedines*, and Drs. Cunningham and Lewis are working effectively in India. It is to be regretted that Mr. Renny has never published the numerous new genera he has figured in this department, which vie, for beauty and singularity, with anything which has been recorded by van Tieghem. Mr. Abbay has lately made some curious observations on the germination of the spores of *Hemileia*, which is so destructive in the coffee plantations of Ceylon. He does not, however, seem to be aware, that Mr. Thwaites had already observed that the species in germinating always produce a *Penicillium*, though Mr. Abbay has much extended his observations.

Brefeld and Rees have made many valuable observations with respect to the production of asci with sporidia in yeast. Rees, however, states that under the most advantageous conditions he has never been able to induce the globules to send out threads of mycelium. This was, however, done by Mr. Hoffman, of Margate, the account of whose observations, in company with the author of the present notice, are recorded in the article "Yeast," in the "Cyclopædia of Agriculture," the same manipulation showing that the Sclerotium of onions is a condition of a minute Mucor. Their success depended upon having the disk of water in which a very limited number of yeast globules were inclosed, being surrounded in a sealed cell with an atmosphere of air.

These observations should not be closed without a notice of Woronin's very complete observations on the disease commonly known as the club in cabbages. He not only succeeded in discovering the fungus to which it is due, but was enabled to complete his experiments by its actual cultivation. The figures which accompany his memoir are beyond all praise. We may expect more from his hand on these obscure productions. The genus *Protomyces* will probably afford some unexpected results, and we may yet hope for something more satisfactory on

the nature of the bodies which are so common on the roots of Leguminosæ.

Finally, M. Cornu's researches in the Saprolegniæ have increased our knowledge of these curious organisms, most authorities being now of opinion that they are aquatic fungi; while many other valuable communications, of almost equal interest, are necessarily omitted.

M. J. BERKELEY

GEOGRAPHICAL NOTES

THE April number of the Geographical Society's new periodical contains Mr. Comber's paper on his explorations inland from Mount Cameroons, and his journey through Congo to Makuta, the late Capt. Patterson's notes on the Bamangwate country, South Africa, and Gen. Kaye's paper on the mountain passes leading to the Valley of Bamian, all of which were read at recent meetings. These are followed by some remarks on the colouring of maps, by Prof. Cayley, the Council's memorial respecting professorships of geography, &c. The geographical notes contain several items of interest. In one are some useful explanatory remarks respecting Major Pinto's reported "solution of the Cubango mystery," while another fixes the locality of Lake Chaia (not marked on any of our maps) near which Lieut. Wauthier died and Mr. Penrose was murdered. There are also some particulars respecting Japanese colonisation in the Island of Yesso, and Mr. Alex. Forrest's expedition to explore and survey the unknown tract of country between the De Grey and Victoria rivers in North-western Australia. The present number is illustrated by two maps, the one of Mount Cameroons and the neighbouring country, from a drawing by Mr. Comber, and the other of the Bamangwate country, also from new material.

THE *Globe* gives the following as the official programme that has been drawn up for the "Imperial Expedition" to Central Asia, under the command of the Grand Duke Nicholas Constantinovitch. The staff of the expedition will be an engineer from the Ministry of Railways, an officer of the Baltic fleet, a surveyor, a naturalist, an archæologist, a geologist, a painter, a correspondent, and a topographer. The aim of the expedition is to select the route of the Central Asian Railway, to examine the navigability of the Oxus, and to decide the possibility of diverting it into the Caspian. The route will be from the River Ural to Karasugai, on the Syr Daria, thence *viâ* Tashkend and Samarcand to the Oxus at Kunduz (Afghanistan); afterwards along the river to Khiva, and across the Kara Kum to Krasnovodsk. The work of the expedition will be: 1. To collect information as to the cost of the railway, the ability to obtain materials for its construction, whether fuel exists on the route, and the amount of labour obtainable. 2. To investigate the speed of the Oxus, the height of its banks, the population of the nearest towns and settlements, and the existing commerce on the river. 3. To examine the Khiva oasis, the floods of Sari Kamish, and the ancient bed of the Oxus, commonly known as the Uzboc. 4. To carry out astronomical observations all the way along the route, to make military plans, to sketch the features of the country, to collect objects of mineralogical, zoological, geological, and archæological interest, and to keep a journal of daily events. Finally, in collecting information respecting the ancient course of the Oxus, to decide whether it can be diverted afresh into the Caspian without detriment to the Khivan oasis. It seems possible, however, that in case of certain Eastern complications the expedition may develop into a military one against Merv.

FURTHER news has been received from Dr. Crevaux, the explorer of French Guiana. He returned to Guiana about the middle of last year for the purpose of exploring